# DRAFT

**ENDANGERED AND THREATENED SPECIES STUDY**
**INITIAL INVESTIGATION**
**Proposed Aerohaven Park**
**Evesham Township, New Jersey**

***PREPARED FOR:***

**Evesham Township**
984 Tuckerton Road
Marlton, New Jersey 08057

***PREPARED BY:***

**Environmental Resolutions, Inc.**
124 Gaither Drive, Suite 160
Mount Laurel, New Jersey 08054

Barbara J. Fegley, AICP, PP

***DATE:***

November, 2000
#22017

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## APPENDICES

## 1.0 ENDANGERED AND THREATENED SPECIES INVESTIGATION

The purpose of this study is to review the development plan of the proposed Aerohaven recreation site in Evesham Township in conjunction with potential habitats for endangered and threatened species. The study involves a review of available literature including the Pinelands Commission and New Jersey Natural Heritage Program files of documented habitats and site investigations to determine the on-site habitat potential for endangered and threatened species. Specific species of concern are Timber Rattlesnake *(Crotalus horridus)*, Pine Barrens Tree Frog *(Hyla andersonii)*, Barrat's Sedge *(Carex barrattii)*, Swamp Pink *(Helonias bullata)*, and Northern Pine Snake *(Pituophis melanoleucus)*.

## 2.0 PROPOSED RECREATION PARK PROJECT

The proposed recreation site under study consists of two parcels totaling approximately 412 acres. The first parcel is the 212 acre Aerohaven site situated on Block 57 Lots 1 and 2. This parcel is owned by the Township and contains an abandoned airplane runway, other disturbed areas, and wooded uplands and wetlands. The second parcel is situated on part of Block 52 Lot 1. Approximately 200 acres of the overall 711 acres included in this tract are proposed for the recreation project. The parcel was originally part of the former Kings Grant Phase II residential project. The tract is owned by the Evesham Township Municipal Utilities Authority. The remaining 511 acres of this site are proposed to be preserved for passive recreation and hiking trails.

The Aerohaven Park, Scheme #2 Plan, prepared by T & M Associates, and dated March 2000, includes the following uses:

Seventeen soccer/multi-purpose fields
Restroom/storage buildings
Two varsity baseball fields
Indoor recreation center
Two baseball/softball fields
Four little league fields
Three to five MUA Recharge Lagoons
Football field with running track
Four tennis courts
Four court sports lots
BMX course and skateboard facility
Maintenance garage
Tot lots
Sledding area
Trail system for pedestrians and cyclists
Nature interpretation areas
Picnic areas
Access roadways and parking lots
Stormwater retention basins

The Aerohaven Park plan includes a depiction of the wetlands line and a three hundred foot wetlands buffer. All permanent, active improvements are proposed in uplands and beyond the three hundred foot buffer. Portions of the nature trail and nature study areas are situated within the buffer and a portion of one of the nature trails is proposed through the wetlands to the stream corridor.

## 3.0 PINELANDS COMMISSION FILE REVIEWS

A December 30, 1999 letter from Parker McCay & Criscuolo, PA and Narrative Description to Ms. Kathy Swigon of the Pinelands Commission (Appendix A) identified a number of potential endangered and threatened species of concern on the Aerohaven site. As the Narrative Description states, "Key environmental considerations will impact the development of the site. For example, large areas of delineated freshwater wetlands exist on the proposed park site. In addition, a hibernaculum of timber rattlesnakes is known to exist near the site on Stone Mountain to the east. Furthermore, the proposed park appears to be in the home range of the Pine Barrens Treefrog, Barrat's sedge, and swamp pink." A June, 2000 telephone conversation with Gene Montgomery of the Pinelands Commission and Environmental Resolutions, Inc. was held to obtain further information concerning the identified potential threatened and endangered species. At this time, the Northern Pine Snake was added to the list of species to be studied.

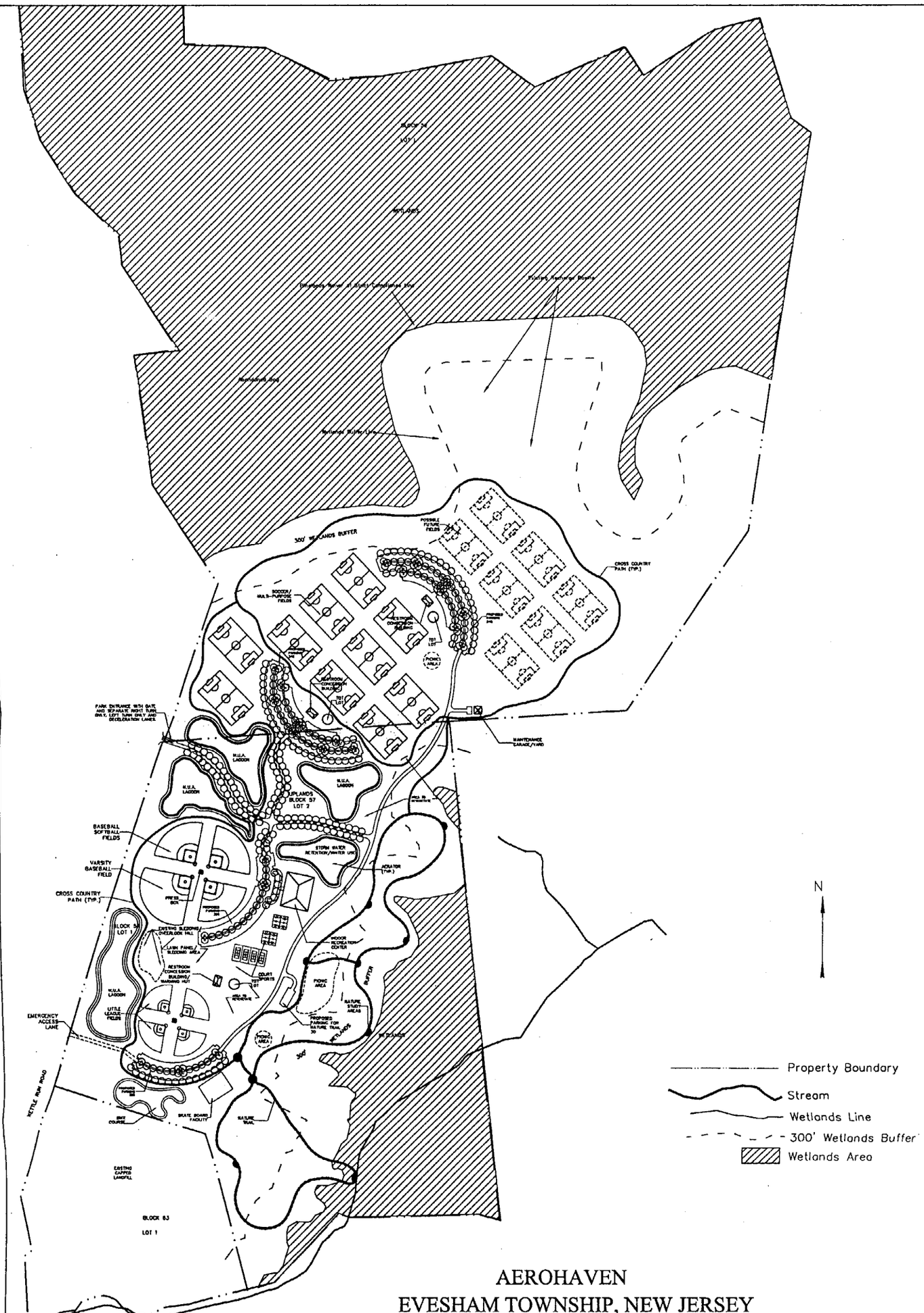
## 4.0 NEW JERSEY NATURAL HERITAGE DATABASE SEARCH

A request was made to the New Jersey Department of Environmental Protection, Division of Parks and Forestry, Office of Natural Lands Management, Natural Heritage Program, for a database search of rare species on the Aerohaven site. A November 1, 2000 report from the Natural Heritage Program (Appendix B) states the following:

> "The project may be within the home range of timber rattlesnakes from a nearby hibernaculum. The Natural Heritage Data Base also has a record for an occurrence of pine barrens treefrog that may be on the site, and for two other occurrences of timber rattlesnake and for Helonias bullata that may be in the immediate vicinity of the site."

The database search identified the following species as <u>possibly on</u> the project site:

> Timber Rattlesnake, observed October 27, 1999 at multiple observation points within an area approximately bounded by Little Mill Golf Course and Lost Lake to the north, west Jersey Cranberry meadow to the east, Louden to the south and Berlin to the west.
>
> Pine Barrens Treefrog, observed May 19, 1983 at Kings Grant bog, approximately two miles south of Tomlinson Mill and 0.1 miles east of Kettle Run Road.




# AEROHAVEN
# EVESHAM TOWNSHIP, NEW JERSEY

PLAN PREPARED BY:

T&M ASSOCIATES

JANUARY 2000
REVISED FEBUARY 2000
REVISED MARCH 2000

PLAN REDUCED BY:

ENVIRONMENTAL ENGINEERS SCIENTISTS PLANNERS
124 GAITHER DRIVE, SUITE 160
MOUNT LAUREL, NEW JERSEY 08054

The database identified the following species as in the immediate vicinity of the project site:

Timber Rattlesnake, observed July 2, 1999 in the backyard of 6 Prince Andrew Court.

Timber Rattlesnake, observed May 5, 1938, two to three miles south of Tomlinson's Mill.

Swamp Pink, observed in 198? (Date unknown) 0.75 miles north of the intersection of Kettle Run Road and Taunton Avenue on the west side of the road.

The correspondence also included a listing of all other rare species and natural communities presently recorded in the New Jersey Natural Heritage Database for Burlington County. Barratt's sedge and Northern Pine Snake were included on the County list but not on the site or vicinity list.

## 5.0 HABITATS AND CHARACTERISTICS-ENDANGERED AND THREATENED SPECIES OF CONCERN

The potential impact of the Park plan to species of concern was reviewed based on the information from the Pinelands Commission and the New Jersey Natural Heritage Database results. Following are characteristics and habitat requirements for each species and a discussion of the potential impact of the park development.

### 5.1 Barratt's Sedge *(Carex barrattii)*

#### 5.1.1 Habitat and Characteristics

Barratt's sedge is listed by the Pinelands Commission and is protected in the Pinelands by the commission. The plant is not on the State list of Endangered Species. Barratt's sedge is a loosely tufted perennial member of the sedge family that occurs in small to large colonies. Barratt's sedge occurs in pitch pine-pine barren reed grass communities and pitch pine lowlands. The plant is listed as an obligate on the National List of Plant Species that Occur in Wetlands: Northeast (Region 1). Under natural conditions, an obligate wetland plant almost always occurs in wetlands.

### 5.1.2 Potential Project Impact

Barratt's sedge may be present in the wetland areas of the site. The species was not identified during the site investigations conducted to date. Because the plant is an obligate, it would only be anticipated in the wetlands, or possibly in the lower edge of the buffer. The proposed nature trail is shown within this lower limit of the buffer in several locations and within the wetlands and stream at one location. It is recommended, based on this design, that these encroachment areas be located in the field and specifically investigated for the presence of Barratt's sedge and if present, the layout be redesigned to avoid impact to the plant. An alternative would be to relocate the nature study area and trail further upland from the wetlands and buffer.

## 5.2 Swamp Pink *(Helonias bullata)*

### 5.2.1 Habitat and Characteristics

Swamp pink is listed as a federal, state, and Pinelands threatened or endangered plant. Swamp pink is a member of the lily family that occurs as individual plants or more commonly, in clusters. Swamp pink grows in hummocks formed by trees, shrubs and spagnum moss in forested wetlands. The plant is found in small meanderings streams, headwater wetlands, or in spring seepage areas. The plant is listed as an obligate in the National List of Plant Species that Occur in Wetlands: Northeast (Region 1). Under natural conditions, an obligate wetland plant almost always occurs in wetlands.

### 5.2.2 Potential Project Impact

Swamp pink may be present in the extensive wetland areas of the site. The species was not identified on the site during investigations conducted to date. Because the plant is an obligate that is present in streams and seeps, it would only be anticipated in the wetlands. The proposed nature trail is shown within the lower limit of the buffer in several locations and within the wetlands and stream at one location. It is recommended based on this design, that these encroachment areas be located in the field and specifically investigated for the presence of Swamp pink and if present, the layout should be redesigned to avoid impact to the plant. An alternative would be to relocate the nature study area and trail further upland of the wetlands and buffer.

## 5.3 Pine Barrens Treefrog *(Hyla andersonii)*

### 5.3.1 Habitat and Characteristics

Pine Barrens Treefrog is listed as Endangered by the State of New Jersey Department of Environmental Protection and the Pinelands Commission. Pine Barrens Treefrogs occur in a variety of natural habitat types including wet areas in pitch pine lowlands, intermittent streams, backwater areas along streams, seeps, small pools in sphagnaceous bogs, isolated ponds, and Atlantic white cedar swamps. They are also known to occur in artificial habitats such as cranberry bogs, small stream impoundments, vehicle ruts, borrow pits, and roadside ditches.

### 5.3.2 Potential Project Impact

There is the potential that Pine Barrens Treefrog is present on the site and utilizing areas within the wetlands systems. During site investigations, however, the treefrog was not observed. It is recommended that the wetlands and stream corridor and areas with buffer encroachments proposed for the nature trail and study area be investigated in the spring for the presence of Pine Barrens Treefrog. Treefrog presence is most easily identified through vocalization during the breeding season of mid May through late June. If Pine Barrens Treefrogs are present in or near the nature trail or study area, it is recommended that the park plan be revised.

## 5.4 Timber Rattlesnake *(Crotalus horridus)*

### 5.4.1 Habitat and Characteristics

The Timber Rattlesnake is listed as Endangered by the State of New Jersey Department of Environmental Protection and the Pinelands Commission. Timber rattlesnakes in the Pine Barrens begin their hibernation in mid to late October. The snakes hibernate along cedar streams, in underground flowing water at the base of cedar trees, where the root system of the trees provide protection. The constantly flowing water prevents the snakes from freezing. The snakes emerge from hibernation in mid to late April. After emerging from hibernation, the rattlesnake migrates away from the cedar swamp stream corridor to upland pine-oak forest. The timber rattlesnake is therefore present in both upland and wetland habitats.

### *5.4.2* Potential Project Impact

There is a moderate to high potential that Timber Rattlesnake is present on the site and utilizing both the uplands and wetlands. Herpetological Associates, Inc., specialists in identifying and evaluating habitat potential, performed a Habitat Evaluation study for the Timber Rattlesnake during September, 2000. A copy of their report is included in Appendix C. Herpetological Associates, Inc. conducted two site visits of the property on September 7 and 12, 2000. The three persons teams did not encounter timber rattlesnake, however, based on their site visits, it is concluded that the site has habitat potential. The former air strip, open fields and surrounding upland forest have a high potential habitat for the rattlesnake and the cranberry bogs, stream and wetland corridor have potential habitat for the snake. It is recommended that a Phase II intensive timber rattlesnake study be conducted during the Spring (April) and summer (through August) to allow observation during the most appropriate time period for use by the species. If it is concluded that the Timber Rattlesnake is present on the site, recommendations for buffers from the habitat will be made to determine the impact on the recreation plan.

## 5.5 Northern Pine Snake *(Pituophis melanoleucus)*

### 5.5.1 Habitat and Characteristics

The Northern Pine Snake is listed as Threatened by the State of New Jersey Department of Environmental Protection and the Pinelands Commission. The snake is normally found in uplands, inhabiting the dry pitch pine/oak areas of the Pine Barrens, away from creeks and cedar swamps. The snakes emerge from their dens in mid spring, usually April, in New Jersey. The snakes den at the bases of old decaying stumps or in abandoned mammal burrows. The Pine Snake was not originally identified by the Pinelands Commission or New Jersey Natural Heritage Program as a target species, however, in conversation with Herpetological Associates, Inc. it was concluded that this species may be present on the site.

### 5.5.2 Potential Project Impact

Herpetological Associates, Inc., conducted a habitat evaluation for Northern Pine Snake at the same time as their Timber Rattlesnake studies. A report of their findings is included in Appendix C. During their September 7 and 12, 2000 site visits, Northern Pine Snake was not encountered, however, based on their site visits, it is concluded that the site has habitat potential. The former air strip, open fields and surrounding upland forest and the cranberry bogs, stream and wetland corridor have potential habitat for the Pine Snake. It is recommended that a Phase II intensive Northern Pine Snake study be conducted during the Spring (April) and Summer (through August) to allow observation during the most appropriate time period for use by the target species. If it is concluded that the Northern Pine Snake is present on the site, recommendations for buffers from the habitat will be made to determine the impact on the recreation plan.

## 6.0 RECOMMENDATIONS AND CONCLUSIONS

Impacts to the vascular plant species of Swamp Pink and Barratt's Sedge and vertebrate species of the Pine Barrens Treefrog can easily be avoided with modifications to the design of the park plan by eliminating encroachment into the wetlands and lower buffers by the nature trail and study areas. Field studies of these specific encroachment areas can be conducted after the areas are clearly delineated on the site.

More intensive Phase II studies will be required for the Timber Rattlesnake and the Northern Pine Snake to determine whether the species are present, the extent of their habitat, and recommended buffer requirement.

# APPENDIX A

## December 30, 1999 letter from Parker McCay & Criscuolo, PA
## Narrative Description

PMC
Parker McCay & Criscuolo P.A.
ATTORNEYS AT LAW

Three Greentree Centre
Route 73 and Greentree Road
Marlton, New Jersey 08053
Telephone: 856-596-8900
Telecopier: 856-596-9631
Email: pmcc@pmclaw.com
Web: www.pmclaw.com

Richard W. Hunt

December 30, 1999

File No. 09325-0029
*Sent Via Facsimile*

Ms. Kathy Swigon, Manager, Project Review Group
Pinelands Commission
P.O. Box 7
New Lisbon, NJ 08064

Re: **Township of Evesham**
**Proposed Recreational Park**

Dear Ms. Swigon:

On behalf of Evesham Township, it was a pleasure meeting with you on Monday, December 20, 1999 regarding the above referenced project. As per our discussion, and your suggestion, I enclose for consideration by the Commission and the CMP Project Committee, a Narrative Description of the project, addressing both the recreational and recharge lagoon components, as well as the betterment to be achieved by the overall project. I understand that the Committee will be meeting on January 4th. Please advise as to whether you would like a representative of the Township to attend.

Very truly yours,

RICHARD W. HUNT

RWH/amd
Cc: Mayor and Members of Council
Florence Ricci, Township Manager
Patrick Haynes, Recretional Director
Edward Kondracki, Esquire
Evesham Township Municipal Utilities Authority
William Harrison, Acting Director

# PROPOSED RECREATION PARK PROJECT
# EVESHAM TOWNSHIP
# NARRATIVE DESCRIPTION
## December 1999

Evesham Township is desirous of creating a new municipal park in the southern portion of the Township to meet the growing active and passive recreational needs of its residents. The area being considered consists of two parcels. The first site, Aerohaven, in Block 57, Lots 1 and 2, totals approximately 212 acres. This parcel is currently owned by the Township and contains an abandoned airplane runway and other disturbed areas, as well as a large wooded tract containing freshwater wetlands. The second parcel consists of a 200+/- acre portion of the former Kings Grant – Phase II proposed residential project in Block 52, Lot 1, which consists of 711 acres total. This 200+/- acre portion is located in the southern region of the overall site, and is contiguous to the Aerohaven site immediately to the south. Acquisition of the latter parcel by the Township from the Evesham Township Municipal Utilities Authority (MUA), is anticipated within the next couple months, with funding assistance being provided by Green Acres and Burlington County. This property was originally approved for the construction of approximately 240 residential units. Combining the developable portion recreational site under consideration by Evesham Township therefore consists of approximately 412+/- acres. The remaining approximate 500 acres on the Phase II site will be preserved in perpetuity and can further provide passive recreation in the forming of nature or hiking trails. The Access to the proposed park site would be via Kettle Run Road.

Key environmental considerations will impact the development of the site. For example, large areas of delineated freshwater wetlands exist on the proposed park site. In addition, a hibernaculum of timber rattlesnakes is known to exist near the site on Stone Mountain to the east. Furthermore, the proposed park appears to be in the home range of the Pine Barrens tree frog, Barrat's sedge, and swamp pink. A preliminary determination of these environmental factors suggests that approximately 256 of the total 412+/- acres could be suitable for development (see enclosed map). Additional detailed studies to be conducted in the near future may modify this acreage determination.

Like many communities throughout New Jersey, Evesham Township is experiencing a considerable demand for additional recreational facilities. The need for athletic fields to accommodate organized soccer, football, baseball and softball is particularly strong and will remain so as the Township's population continues to grow. The Kettle Run Road park site is therefore being proposed to meet both the immediate and longer term demands for athletic facilities in Evesham Township.

The proposed park site is in a rural development area per the Pinelands Commission guidelines. This classification permits substantial development of the site for both active and passive recreational usage. A preliminary list of facilities proposed by the Township for the park includes the following:

- Approximately 20 athletic fields, with several illuminated for night usage
- One football field with adjacent running track
- Four tennis courts
- Two basketball courts
- One BMX course and one skateboard facility
- One indoor recreation center of approximately 30,000 square feet
- One or more restroom/storage buildings
- One 3-bay maintenance garage
- One or more tot lots
- One sledding area
- A comprehensive trail system throughout the park for pedestrians and bicyclists
- Nature interpretation areas
- Picnic areas
- Access roadway and related parking areas

The park is intended to utilize the cleared and previously disturbed portions of the Aerohaven site as much as possible to accommodate some of this proposed development. This will minimize site disturbance and vegetative removal. Storm water management facilities (detention basin, etc.) will also be required at the park site. The Township will utilize its in-place Integrated Pest Management (I.P.M.) system and proper athletic field fertilization procedures to assure correct usage of pesticides, etc. If considered necessary, monitoring wells could be installed near freshwater wetlands areas. An estimated 125-175 acres would be needed for the recreation facilities.

A secondary proposed component of the site under consideration would be for the construction of 3-5 recharge lagoons and related facilities (access roadway, etc.) by the EMUA to hold treated effluent resulting from the Kings Grant – Phase I site. These lagoons/holding ponds would be designed to be aesthetically appealing in configuration. They could also be situated throughout the park and become attractive recreational amenities. The quality of the contained water would permit its reuse for irrigation purposes, possibly via an underground system of drip irrigation. An estimated 25-35 acres would be needed for these lagoons, depending upon their location, required

capacity, etc. It should be noted that this Project is part of a comprehensive overall Open Space Incentive Plan developed by the Township of Evesham. This Plan has been submitted to County Open Space and the State Green Acres Program and the Township is working closely with both agencies. Because Evesham Township adopted a dedicated open space tax (pursuant to a voter's referendum in the November, 1998 election), it is eligible to receive acquisition monies in the form of a 50% grant (from the State) and a 25% loan (from the County) of the appraised value of targeted parcels, with the remaining 25% coming from the Township. Over 5,000 acres, and 150 separate parcels are being considered for acquisition under Evesham's plan.

This plan is intended "to acquire additional property to increase the area of existing recreation sites currently owned by the Township, provide stream corridor protection and greenbelt linkages to existing and future sites, preserve farmland through the purchase of development rights, acquire Pinelands properties to protect watershed areas and to link open space to State holdings (Wharton Tract)." Evesham Township Narrative Description, submitted to Green Acres, November 29, 1999. (Copy enclosed). The appraisal process has already begun with respect to nine (9) priority sites within the Township, including Kings Grant – Phase II.

In conjunction with the siting of the detention lagoons on the Aerohaven site necessary to meet the needs of the EMUA and Evesham Township residents, the Township is in a position to provide an overall betterment to the community and region by preserving the previously mentioned Kings Grant - Phase II site. This 711 +/- acre tract, to be purchased from the EMUA, will eliminate the development of 240+/- residential units on the site. In addition, the Township's Plan includes the preservation of significant portions of the "Pachoango" tract and adjacent properties, a documented habitat for timber rattlesnakes. The overall protection afforded to Pinelands areas under the Plan far exceeds the current level of protection; and will ensure the area will be preserved in perpetuity. The location of lagoons on the Aerohaven site is integral to the overall Plan; it is submitted that the overall benefit to be derived from the Recreation Park Plan, and the Township's Open Space preservation initiative, is ample justification for the lagoon siting. Again, the lagoons as proposed by the EMUA appear to be attractive aesthetic additions to the proposed park, and may be used for irrigation purposes.

In summary, Evesham Township is primarily interested in developing the above-referenced site to create an active and passive recreational facility to meet the present and future needs of its population. Wherever possible, previously disturbed areas of the site will be maximized for the placement and construction of the proposed facilities. A secondary component, the construction of holding ponds, would be sited and shaped to compliment the park. The preparation of preliminary concept master plans showing the type and amount of facilities will be prepared and submitted to the Pinelands Commission in the near future. These plans will take into careful consideration all existing environmental constraints, supplemented by any additional data which may be received, to assure a facility that is compatible with and complimentary to the existing environmental conditions on site. The Township hopes to commence construction by mid-2000 and have the project fully constructed and usable by the Summer of 2001.

# APPENDIX B

## Natural Heritage Program Database

State of New Jersey

Christine Todd Whitman
*Governor*

Department of Environmental Protection
Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

Robert C. Shinn, Jr.
*Commissioner*

November 1, 2000

Barbara J. Fegley
Environmental Resolutions, Inc.
124 Gaither Drive, Suite 160
Mount Laurel, NJ 08054

Re: Aerohaven

Dear Ms. Fegley:

Thank you for your data request regarding rare species information for the above referenced project site in Evesham Township, Burlington County.

Your project may be within the home range of timber rattlesnakes from a nearby hibernaculum. The Natural Heritage Data Base also has a record for an occurrence of pine barrens treefrog that may be on the site, and for two other occurrences of timber rattlesnake and for *Helonias bullata* that may be in the immediate vicinity of the site. The attached lists provide more information about these occurrences. **Because some species are sensitive to disturbance or sought by collectors, this information is provided to you on the condition that no specific locational data are released to the general public. This is not intended to preclude your submission of this information to regulatory agencies from which you are seeking permits.**

Also attached is a list of rare species and natural communities that have been documented from Burlington County. This county list can be used as a master species list for directing further inventory work. If suitable habitat is present at the project site, these species have potential to be present. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend you contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Thomas F. Breden
Supervisor

cc: Lawrence Niles
Thomas Hampton
NHP File No. 00-3907478

# CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the data base. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

**This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.**

CT 2000

POSSIBLY ON PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

| | COMMON NAME | FEDERAL STATUS | STATE STATUS | REGIONAL STATUS | GRANK | SRANK | DATE OBSERVED | IDENT. | LOCATION |
|---|---|---|---|---|---|---|---|---|---|
| Vertebrates | | | | | | | | | |
| ALUS HORRIDUS HORRIDUS | TIMBER RATTLESNAKE | | E | | G4T4 | S2 | 1999-10-27 | Y | MULTIPLE OBSERVATION POINTS WITHIN AN AREA APPROXIMATELY BOUNDED BY LITTLE MILL GOLF COURSE AND LOST LAKE TO THE NORTH, WEST JERSEY CRANBERRY MEADOW TO THE EAST, LOUDEN TO THE SOUTH AND BERLIN TO THE WEST. |
| A ANDERSONII | PINE BARRENS TREEFROG | | E | | G4 | S3 | 1983-05-19 | Y | EVESHAM TWP., KINGS GRANT BOG [APPROX. 2 MILES S. OF TOMLINSON MILL, 0.1 MILES EAST OF KETTLE RUN RD.]. |

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2000

IMMEDIATE VICINITY OF PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

| | COMMON NAME | FEDERAL STATUS | STATE STATUS | REGIONAL STATUS | GRANK | SRANK | DATE OBSERVED | IDENT. | LOCATION |
|---|---|---|---|---|---|---|---|---|---|
| rtebrates | | | | | | | | | |
| US HORRIDUS HORRIDUS | TIMBER RATTLESNAKE | | E | | G4T4 | S2 | 1999-07-02 | Y | IN BACKYARD OF 6 PRINCE ANDREW COURT, EVESHAM TOWNSHIP. |
| US HORRIDUS HORRIDUS | TIMBER RATTLESNAKE | | E | | G4T4 | S2 | 1938-05-28 | Y | TWO - THREE MILES SOUTH OF TOMLINSON'S MILL, EVESHAM TOWNSHIP. |
| scular plants | | | | | | | | | |
| AS BULLATA | SWAMP-PINK | LT | E | LP | G3 | S3 | 198?-??-?? | Y | 0.75 MI. N. OF INTERSECTION OF KETTLE RUN RD. & TAUNTON AVE. ON W. SIDE OF ROAD. |

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## EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

### FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

| | |
|---|---|
| LE | Taxa formally listed as endangered. |
| LT | Taxa formally listed as threatened. |
| PE | Taxa already proposed to be formally listed as endangered. |
| PT | Taxa already proposed to be formally listed as threatened. |
| C | Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species. |
| S/A | Similarity of appearance species. |

### STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

| | |
|---|---|
| D | Declining species-a species which has exhibited a continued decline in population numbers over the years. |
| E | Endangered species-an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow. |
| EX | Extirpated species-a species that formerly occurred in New Jersey, but is not now known to exist within the state. |
| I | Introduced species-a species not native to New Jersey that could not have established itself here without the assistance of man. |
| INC | Increasing species-a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period. |
| T | Threatened species-a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate. |
| P | Peripheral species-a species whose occurrence in New Jersey is at the extreme edge of its present natural range. |
| S | Stable species-a species whose population is not undergoing any long-term increase/decrease within its natural cycle. |
| U | Undetermined species-a species about which there is not enough information available to determine the status. |

Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.

S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.

S3 Rare in state with 21 to 100 occurrences (plant species in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.

S4 Apparently secure in state, with many occurrences.

S5 Demonstrably secure in state and essentially ineradicable under present conditions.

SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.

SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).

SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.

SP Element has potential to occur in New Jersey, but no occurrences have been reported.

SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.

SRF Elements erroneously reported from New Jersey, but this error persists in the literature.

SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.

SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.

SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.

SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and

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BURLINGTON COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

ertebrates

| NAME | COMMON NAME | FEDERAL STATUS | STATE STATUS | REGIONAL STATUS | GRANK | SRANK |
|---|---|---|---|---|---|---|
| ACCIPITER COOPERII | COOPER'S HAWK | | T/T | | G5 | S3B,S4N |
| ACIPENSER BREVIROSTRUM | SHORTNOSE STURGEON | LE | E | | G3 | S3 |
| AMBYSTOMA TIGRINUM TIGRINUM | EASTERN TIGER SALAMANDER | | E | | G5T5 | S2 |
| AMMODRAMUS SAVANNARUM | GRASSHOPPER SPARROW | | T/S | | G5 | S2B |
| ARDEA HERODIAS | GREAT BLUE HERON | | S/S | | G5 | S2B,S4N |
| BARTRAMIA LONGICAUDA | UPLAND SANDPIPER | | E | | G5 | S1B |
| BOTAURUS LENTIGINOSUS | AMERICAN BITTERN | | E/S | | G4 | S2B |
| BUTEO LINEATUS | RED-SHOULDERED HAWK | | E/T | | G5 | S1B,S2N |
| CIRCUS CYANEUS | NORTHERN HARRIER | | E/U | | G5 | S1B,S3N |
| CISTOTHORUS PLATENSIS | SEDGE WREN | | E | | G5 | S1B |
| CLEMMYS INSCULPTA | WOOD TURTLE | | T | | G4 | S3 |
| CLEMMYS MUHLENBERGII | BOG TURTLE | LT | E | | G3 | S2 |
| CROTALUS HORRIDUS HORRIDUS | TIMBER RATTLESNAKE | | E | | G4T4 | S2 |
| DOLICHONYX ORYZIVORUS | BOBOLINK | | T/T | | G5 | S2B |
| ELAPHE GUTTATA GUTTATA | CORN SNAKE | | E | | G5T5 | S1 |
| FALCO PEREGRINUS | PEREGRINE FALCON | | E | | G4 | S1B,S?N |
| GRAPTEMYS GEOGRAPHICA | COMMON MAP TURTLE | | U | | G5 | S3 |
| HALIAEETUS LEUCOCEPHALUS | BALD EAGLE | LT | E | | G4 | S1B,S2N |
| HYLA ANDERSONII | PINE BARRENS TREEFROG | | E | | G4 | S3 |
| MELANERPES ERYTHROCEPHALUS | RED-HEADED WOODPECKER | | T/T | | G5 | S2B,S2N |
| PANDION HALIAETUS | OSPREY | | T/T | | G5 | S2B |
| PASSERCULUS SANDWICHENSIS | SAVANNAH SPARROW | | T/T | | G5 | S2B,S4N |
| PITUOPHIS MELANOLEUCUS MELANOLEUCUS | NORTHERN PINE SNAKE | | T | | G4T4 | S3 |
| PODILYMBUS PODICEPS | PIED-BILLED GREBE | | E/S | | G5 | S1B,S3N |
| POOECETES GRAMINEUS | VESPER SPARROW | | E | | G5 | S1B,S2N |
| PSEUDOTRITON MONTANUS MONTANUS | EASTERN MUD SALAMANDER | | T | | G5T5 | S1 |
| STERNA ANTILLARUM | LEAST TERN | | E | | G4 | S1B |
| STRIX VARIA | BARRED OWL | | T/T | | G5 | S3B |

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| NAME | COMMON NAME | FEDERAL STATUS | STATE STATUS | REGIONAL STATUS | GRANK | SRANK |
|---|---|---|---|---|---|---|
| CICINDELA PATRUELA CONSENTANEA | A TIGER BEETLE | | | | G3T2 | S2S3 |
| CUCULLIA ALFARATA | | | | | G4 | S2? |
| DATANA RANAECEPS | A HAND-MAID MOTH | | | | G3G4 | S3S4 |
| ENALLAGMA PICTUM | SCARLET BLUET | | | | G3 | S3 |
| ENALLAGMA RECURVATUM | PINE BARRENS BLUET | | | | G3 | S3 |
| EUPHYES BIMACULA | TWO-SPOTTED SKIPPER | | | | G4 | S3 |
| FARONTA RUBRIPENNIS | PINK STREAK | | | | G3G4 | S3 |
| GOMPHUS APOMYIUS | BANNER CLUBTAIL | | | | G4 | S1 |
| HELICODISCUS SINGLEYANUS | SMOOTH COIL | | | | G4G5 | S2S3 |
| HESPERIA ATTALUS SLOSSONAE | DOTTED SKIPPER | | | | G3G4T3 | S2S3 |
| HETEROCAMPA VARIA | A NOTODONTID MOTH | | | | G3G4 | S3 |
| HYPOMECIS BUCHHOLZARIA | BUCHHOLZ'S GRAY | | | | G3G4 | S3 |
| IDAEA VIOLACEARIA | A GEOMETRID MOTH | | | | G4 | S1S3 |
| ITAME SP 1 | A SPANWORM | | | | G3 | S3 |
| LAMPSILIS CARIOSA | YELLOW LAMPMUSSEL | | | | G3G4 | S1 |
| LAMPSILIS RADIATA | EASTERN LAMPMUSSEL | | | | G5 | S3 |
| LEPTODEA OCHRACEA | TIDEWATER MUCKET | | | | G4 | S1 |
| LIBELLULA AURIPENNIS | GOLDEN-WINGED SKIMMER | | | | G5 | S1S2 |
| LIGUMIA NASUTA | EASTERN PONDMUSSEL | | | | G4G5 | S1 |
| LITHOPHANE LEMMERI | LEMMER'S PINION MOTH | | | | G3G4 | S2 |
| LITHOPHANE LEPIDA ADIPEL | A NOCTUID MOTH | | | | G4T4 | S3S4 |
| LOXAGROTIS SP 2 | | | | | G1Q | S1 |
| MACROCHILO LOUISIANA | A NOCTUID MOTH | | | | G4 | S2S3 |
| MEROLONCHE DOLLI | DOLL'S MEROLONCHE | | | | G3G4 | S1S3 |
| MEROPLEON COSMION | A NOCTUID MOTH | | | | G4 | S1S2 |
| METARRANTHIS LATERITIARIA | A GEOMETRID MOTH | | | | G2G4 | S1 |
| METARRANTHIS PILOSARIA | COASTAL SWAMP METARRANTHIS | | | | G3G4 | S3S4 |
| METARRANTHIS SP 2 | A GEOMETRID MOTH | | | | G4 | S3S4 |
| NEONYMPHA AREOLATA | A SATYR | | | | G4T3T4 | S3 |
| SEPTENTRIONALIS | | | | | | |

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| NAME | COMMON NAME | FEDERAL STATUS | STATE STATUS | REGIONAL STATUS | GRANK | SRANK |
|---|---|---|---|---|---|---|
| ARTEMISIA CAMPESTRIS SSP CAUDATA | WILD WORMWOOD | | | | G5T5 | S2 |
| ASCLEPIAS LANCEOLATA | SMOOTH ORANGE MILKWEED | | | | G5 | S2 |
| ASCLEPIAS RUBRA | RED MILKWEED | | | LP | G4G5 | S2 |
| ASCLEPIAS VARIEGATA | WHITE MILKWEED | | | | G5 | S2 |
| ASCLEPIAS VERTICILLATA | WHORLED MILKWEED | | | | G5 | S2 |
| ASIMINA TRILOBA | PAWPAW | | E | | G5 | S1 |
| ASTER CONCOLOR | SILVERY ASTER | | | LP | G4? | S2 |
| BIDENS BIDENTOIDES | BUR-MARIGOLD | | E | | G3 | S2 |
| BUCHNERA AMERICANA | BLUE-HEARTS | | | | G5? | SX |
| CACALIA ATRIPLICIFOLIA | PALE INDIAN PLANTAIN | | E | | G4G5 | S1 |
| CALAMAGROSTIS PICKERINGII | PICKERING'S REEDGRASS | | E | | G4 | S1 |
| CALAMOVILFA BREVIPILIS | PINE BARREN REEDGRASS | | | LP | G4 | S4 |
| CALYSTEGIA SEPIUM SSP ERRATICA | A BINDWEED | | | | G5T? | SH |
| CARDAMINE LONGII | LONG'S BITTER CRESS | | E | | G3Q | SH |
| CAREX BARRATTII | BARRATT'S SEDGE | | | LP | G3G4 | S4 |
| CASTILLEJA COCCINEA | SCARLET INDIAN PAINTBRUSH | | | | G5 | S2 |
| CHRYSOPSIS FALCATA | SICKLE-LEAVED GOLDEN ASTER | | | LP | G3G4 | S3 |
| CIRSIUM VIRGINIANUM | VIRGINIA THISTLE | | E | | G3 | S1 |
| CLEISTES DIVARICATA | SPREADING POGONIA | | E | LP | G4 | S1 |
| CORALLORRHIZA TRIFIDA | EARLY CORAL-ROOT | | | | G5 | S2 |
| COREMA CONRADII | BROOM CROWBERRY | | E | LP | G4 | S1 |
| COREOPSIS ROSEA | PINK TICKSEED | | | LP | G3 | S2 |
| CORNUS STRICTA | STIFF DOGWOOD | | | | G5 | S2 |
| CROTONOPSIS ELLIPTICA | ELLIPTICAL RUSHFOIL | | | LP | G5 | S2 |
| CUSCUTA CEPHALANTHI | BUTTON-BUSH DODDER | | E | | G5 | S1 |
| CUSCUTA CORYLI | HAZEL DODDER | | | | G5 | S2 |
| CUSCUTA POLYGONORUM | SMARTWEED DODDER | | | | G5 | S2 |
| CYPERUS LANCASTRIENSIS | LANCASTER FLATSEDGE | | | | G5 | S1 |
| CYPERUS POLYSTACHYOS | COAST FLATSEDGE | | E | | G5 | S1 |

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| NAME | COMMON NAME | FEDERAL STATUS | STATE STATUS | REGIONAL STATUS | GRANK | SRANK |
|---|---|---|---|---|---|---|
| LUDWIGIA HIRTELLA | HAIRY LUDWIGIA | | | LP | G5 | S2 |
| LYGODIUM PALMATUM | CLIMBING FERN | | | LP | G4 | S2 |
| LYSIMACHIA HYBRIDA | LANCE-LEAVED LOOSESTRIFE | | | | G5 | S3 |
| MELANTHIUM VIRGINICUM | VIRGINIA BUNCHFLOWER | | E | | G5 | S1 |
| MICRANTHEMUM MICRANTHEMOIDES | NUTTALL'S MUDWORT | | E | | GH | SH |
| MUHLENBERGIA TORREYANA | PINE BARREN SMOKE GRASS | | | LP | G3 | S3 |
| NARTHECIUM AMERICANUM | BOG ASPHODEL | C | E | LP | G2 | S2 |
| NELUMBO LUTEA | AMERICAN LOTUS | | E | | G4 | S1 |
| NUPHAR MICROPHYLLUM | SMALL YELLOW POND LILY | | E | | G4G5 | SH |
| NYMPHOIDES CORDATA | FLOATING HEART | | | LP | G5 | S3 |
| ONOSMODIUM VIRGINIANUM | VIRGINIA FALSE-GROMWELL | | E | | G4 | S1 |
| OPHIOGLOSSUM VULGATUM VAR PSEUDOPODUM | ADDER'S-TONGUE FERN | | | | G5T5 | S3 |
| PANICUM ACICULARE | BRISTLING PANIC GRASS | | E | | G4G5 | S1 |
| PANICUM OLIGOSANTHES | FEW-FLOWERED PANIC GRASS | | | | G5 | S2 |
| PANICUM SCABRIUSCULUM | SHEATHED PANIC GRASS | | | | G4 | S2 |
| PASPALUM DISSECTUM | MUDBANK PASPALUM | | | | G4? | S2 |
| PENSTEMON LAEVIGATUS | SMOOTH BEARD TONGUE | | E | | G5 | S1 |
| PHLOX PILOSA | DOWNY PHLOX | | E | | G5 | SH |
| PLATANTHERA CRISTATA | CRESTED YELLOW ORCHID | | | LP | G5 | S3 |
| PLATANTHERA INTEGRA | YELLOW FRINGELESS ORCHID | | E | LP | G3G4 | S1 |
| POLEMONIUM REPTANS | GREEK VALERIAN | | E | | G5 | S1 |
| POTAMOGETON CONFERVOIDES | ALGAE-LIKE PONDWEED | | E | | G3G4 | S2 |
| PRENANTHES AUTUMNALIS | PINE BARREN RATTLESNAKE ROOT | | | LP | G4G5 | S2 |
| PTELEA TRIFOLIATA | WAFER ASH | | E | | G5 | S1 |
| RANUNCULUS PUSILLUS | LOW SPEARWORT | | | | G5 | S2 |
| RHYNCHOSPORA CEPHALANTHA | LARGE-HEADED BEAKED RUSH | | | LP | G5 | S3 |
| RHYNCHOSPORA CEPHALANTHA VAR MICROCEPHALA | SMALL-HEADED BEAKED RUSH | | E | | G5T5 | S1 |
| RHYNCHOSPORA INUNDATA | HORNED BEAKED RUSH | | | LP | G3G4 | S2 |

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| NAME | COMMON NAME | FEDERAL STATUS | STATE STATUS | REGIONAL STATUS | GRANK | SRANK |
|---|---|---|---|---|---|---|
| XYRIS FIMBRIATA | FRINGED YELLOW-EYED GRASS | | E | | G5 | S1 |

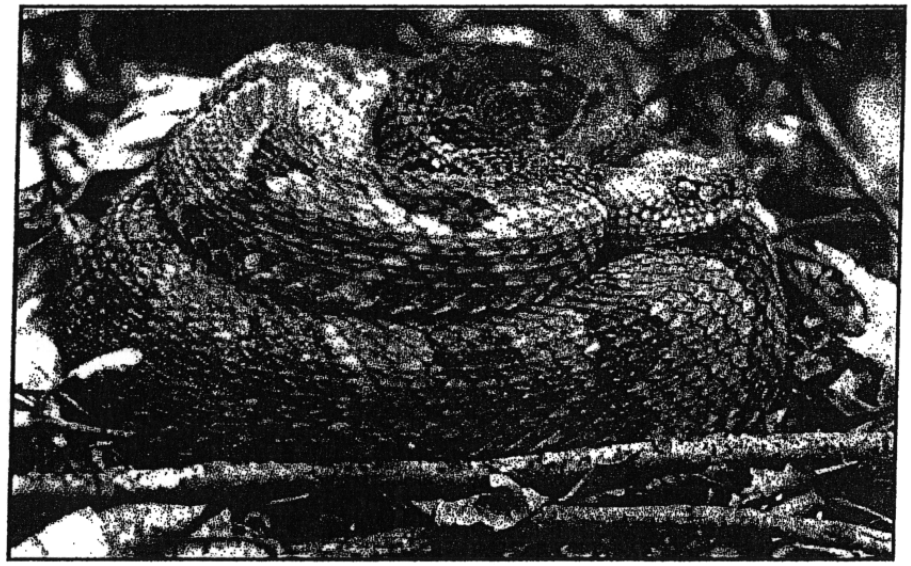
Records Processed

# APPENDIX C

## Habitat Evaluation for Timber Rattlesnake *(Crotalus horridus)* and Northern Pine Snake *(Pituiphis melanoleucus)* at the Aerohaven Site, Evesham Township, Burlington County, New Jersey

*HA File No. 2000.36*

# Habitat Evaluation for Timber Rattlesnake (*Crotalus horridus*) and Northern Pine Snake (*Pituophis melanoleucus*), at the AeroHaven Site in Evesham Township, Burlington County, New Jersey.



**Timber Rattlesnake (*Crotalus horridus*)**

***Submitted on November 2, 2000***

***To***


**Barbara J. Fegley, AICP, PP**

***Environmental Resolutions, Inc.***

**124 Gaither Drive, Suite 160**

**Mt. Laurel, New Jersey 08054-1719**


***By***


**Robert T. Zappalorti and Matthew P. McCort**

***HERPETOLOGICAL ASSOCIATES, INC.***

**Plant and Wildlife Consultants**

**575 Toms River Road, Jackson, New Jersey 08527**

## INTRODUCTION

The Township of Evesham has proposed a recreation park project on the AeroHaven site, Block 57, Lots 1 and 2 in Evesham Township, Burlington County, New Jersey (**Figure 1**). Herpetological Associates, Inc. (hereafter HA) was commissioned by Environmental Resolutions, Inc., to conduct a habitat evaluation and search for endangered or threatened species at the subject property. The species in question were timber rattlesnake (*Crotalus horridus*) and northern pine snake (*Pituophis melanoleucus*).

## METHODS

### Habitat Evaluation

The suitability of the AeroHaven site as habitat for the target species was determined by evaluating existing habitat components. Vegetative types and communities, hydrological conditions, elevation topography, soil characteristics, and surrounding terrestrial habitat were used to evaluate areas as potential rattlesnake and pine snake habitat. In order to standardize the results of our habitat evaluations, the subject property was given a rank for each target species using the Zappalorti Scale (Z-Scale) of 1-5. These numbers would allow reviewers to better understand our rationale which reflects our overall evaluation of the site as critical wildlife habitat. The habitat was ranked on a sliding scale for each species as follows:

**1 = Not suitable for the target species**

**2 = Marginally suitable for the target species**

**3 = Potential habitat for the target species**

**4 = Highly potential habitat for the target species**

**5 = Confirmed critical habitat (target species found at the site)**

### How Habitats Were Evaluated and Determined

HA has three criteria for judging the value of the existing conditions and available habitat for endangered wildlife species. These are:

*1. Structure of Available Habitat:* Both the biotic and abiotic components are considered. These are good indicators for the possible occurrence of specific wildlife species within a habitat. When surveying for pine snakes and timber rattlesnakes, the habitat is evaluated with nesting areas and possible hibernation sites in mind. The vegetative types and communities, typically associated with these snakes and their habitat, are searched. Pine snakes generally nest in areas that are characterized by open sand with plants such as Pennsylvanica sedge (*Carex pensylvanica*), Pine Barrens heather (*Hudsonia ericoides*), and Pine Barrens sandwort (*Arenaria caroliniana*). They require a loamy sugar-sand type substrate in order to dig the burrows that they lay their eggs in (Zappalorti and Burger, 1985). Typical habitat for the Pine Barrens timber rattlesnakes includes a primary permanent flowing stream bed that has the necessary depth and height to allow for partially submerged hibernation. Canopy cover, presence or absence of spring-fed streams, presence of certain plant communities, or other features within a particular study area or ecosystem should be considered (Reinert and Zappalorti, 1988a; Reinert, 1992; Zappalorti and Burger; and Burger and Zappalorti, 1986).

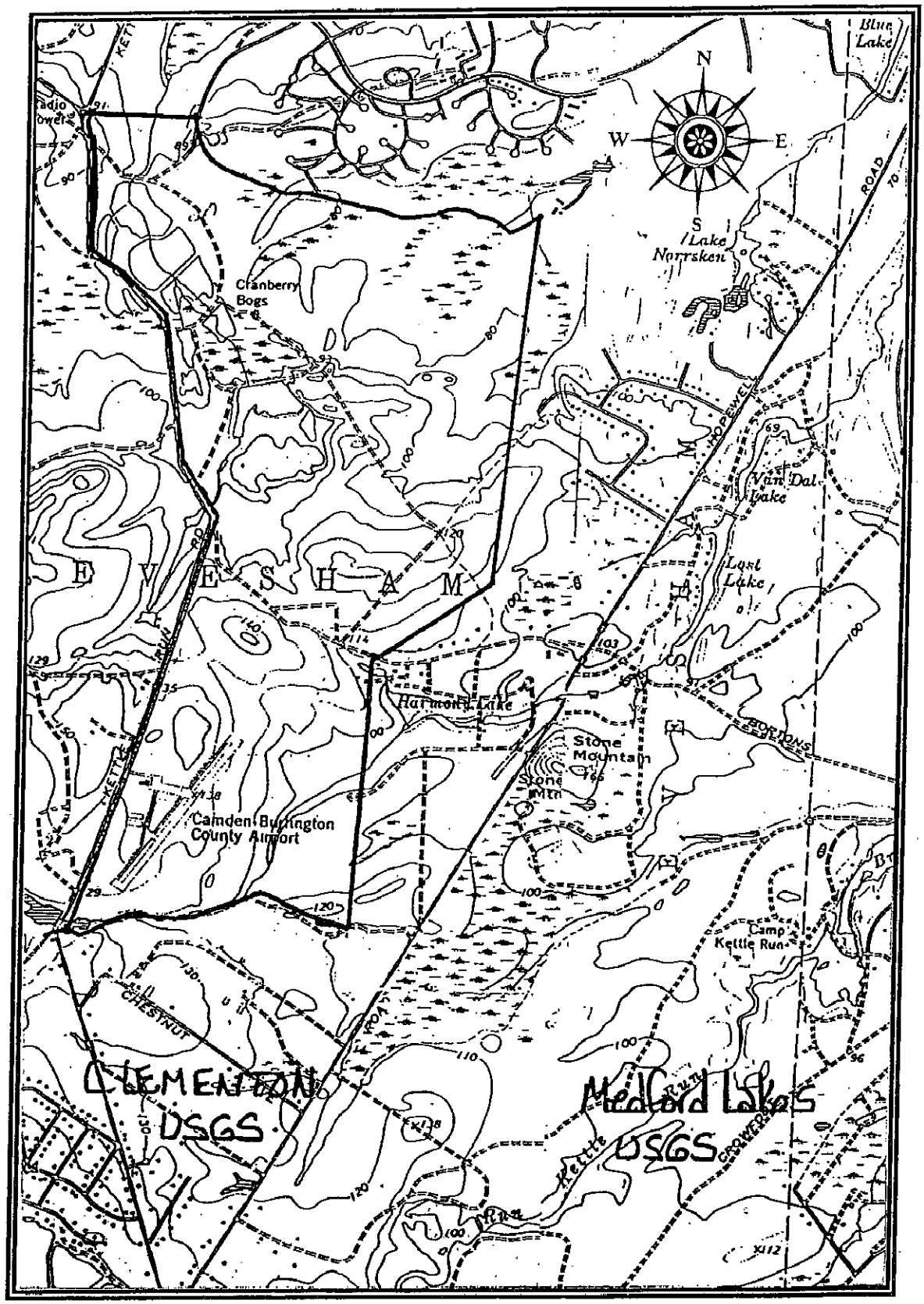



**Figure 1.** U.S.G.S. Topographic Map Showing the Location of the AeroHaven Site, Block 57, Lots 1 and 2 in Evesham Township, Burlington County, New Jersey.

*2. Water Quality and Prey Availability:* A glass container is used to visually determine the clarity, turbidity, smell, and general appearance of the water. The depth, consistency, and type of soil present is also measured to predict its suitability for burrow excavation by nesting pine snakes. The presence of "indicator food species" such as chipmunks, white footed mice, pine voles, red-back voles, and meadow voles also shows habitat suitability.

*3. Physical Evidence:* Natural Heritage historic records from an area, as well as recent sightings, are pertinent. The presence of pine snake or timber rattlesnake signs are also investigated. This consists of walking through the available habitat and carefully looking for basking or hiding snakes in all available exposed basking areas and hiding spots. An attempt to find nests, egg shells, tracks in sand or soil, broken-off rattle segments, shed skins, or bones of these species was also made in all areas within the available habitat (Zappalorti and Johnson, 1982; Reinert and Zappalorti, 1988a; Reinert, 1992; Zappalorti and Burger, 1985; and Burger and Zappalorti, 1986).

**General Herpetological Survey Methods**

Reptiles are often difficult to census due to their highly secretive nature and ability to remain hidden for long periods of time. Environmental conditions such as temperature, precipitation, soil moisture, humidity, light intensity, wind, and season also have strong influences on reptile and amphibian activity patterns (Vogt and Hine, 1982). Improper environmental conditions may lead to increased fossorial behavior, markedly reduced activity, shifts in habitat types used, and/or estivation. Therefore, the use of several sampling techniques which take into account the various aspects of an animal's biology often result in the best assessment of species abundance and richness. The Time Constrained Technique (described below) along with Random Opportunistic Sampling, the Rapid Assessment Method, and Diurnal and Nocturnal Road Cruising were employed in any habitat that showed potential for one or more of the target species.

*Time Constrained Technique.* In this method, a specific habitat is selected (e.g., oak/pine forest, pine/oak forest, wetland corridor) and all potential hiding places for reptiles are searched. Fallen logs, stones, and leaf litter are overturned, as well as artificial hiding places such as discarded sheets of wood or metal, rugs, furniture, etc. Open, sunny areas are searched for surface active or basking snakes. All wetlands, due to their close proximity to the Kettle Run Rattlesnake dens, are searched particularly for rattlesnakes, either active or concealed, although a variety of herptiles are often encountered in wet areas. Spatial boundaries for each search are not set, aside from staying within the selected habitat. During times of the year when target species are known to congregate in particular habitats (e.g., along a stream, or open basking areas) for some aspect of their life history (e.g., breeding, brooding, or hibernating), this method is highly productive and superior to other types of surveys. Time limits are set, ensuring that each habitat is adequately, but not excessively, examined. This method allows a quantitative comparison of species richness, relative abundance, and use between habitats (Campbell and Christman, 1982; Karns, 1986).

*Random Opportunistic Sampling.* A relatively simple method for the trained herpetologist, Random Opportunistic Sampling can be employed while performing other sampling techniques on the study site. This involves searching various areas of the study corridor which show potential habitat for a species of interest, or areas which are conveniently accessible. Locations on-site which do not fall into any specific habitat classification (e.g., disturbed areas, garbage dumps, etc.) may generate previously undiscovered species which would not have been found without the use of this method. All herptiles encountered are recorded to supplement the species list generated by other field methods. This method is effective if there are no time constraints on the survey and the survey area is visited often. Qualitative impressions can be developed as to the relative abundance and habitat use of certain species (Campbell and Christman, 1982; Karns, 1986).

***Rapid Assessment Method***, which is a variation of the time-constrained technique, is useful for determining the presence of a particular species within preselected sites containing potential habitat when only limited time is available for surveys. Generally, a time limit of 1 to 2 hours is allocated to each site (depending on the amount of time available), and a team of several experienced biologists intensively searches the site and performs habitat evaluations. This technique is most useful for examining multiple sites and determining the potential for the target species' presence based upon habitat indicators and whether individuals are found.

***Diurnal and Nocturnal Road Cruising***. Road cruising can be used passively, such as while driving to and from a site or while driving/walking to and from areas on the site, or it can be initiated as a specific surveying technique. This method involves driving a vehicle at slow speed or walking along paved roads or sand trails at various times of the day and/or night. Road cruising is often highly productive on warm, humid or rainy spring nights, or during other high activity times of the year (depending on the species). Snakes moving across roads can be easily identified and/or captured. In addition, roads which border potential habitat often yield dead reptiles or amphibians or other animals, killed as they attempt to cross. These "road-killed" animals can be identified and provide useful information on migration routes, activity patterns, and habitat utilization/partitioning. The basic presence or absence of a species in a particular area can also be easily determined by the identification of their remains (Karns, 1986).

## RESULTS

A 3 person team conducted the field work associated with the habitat evaluations and random searching at the AeroHaven site on the following dates: September 7 and September 12, 2000. This period was the ideal time to be in the field searching because pine snake eggs are hatching and timber rattlesnakes are in the end of their mating and activity season. The beginning of September is when gravid female timber rattlesnakes give birth to their young and hatchling pine snakes emerge from their eggs. Thus, the snakes are more conspicuous and potentially easier to find.

### Description of Existing Conditions

#### *Air-Strip, Open Field, and Surrounding Upland Forest*

The upland areas of this portion of the subject property are characterized by pitch pine (*Pinus rigida*) and various deciduous hardwood trees such as white oak (*Quercus alba*), scarlet oak (*Quercus coccinea*), chestnut oak (*Quercus primus*), and sassafras (*Sassafras albidum*). The edges of the runway contain a large amount of cinder-block debris, piled amidst pitch pine regeneration. There were open grassy areas in this field that contained vegetation characteristic of pine snake nesting habitat. Pennsylvanica sedge (*Carex pensylvanica*) growing in a sandy open area free of tree canopy was found in several areas contained by the open field. This habitat type is consistent with that of pine snake nesting habitat requirements. Because of these physical characteristics, this area, the air-strip, open field, and surrounding upland forest was given a Z-scale rank of 3 (Potential Habitat) for northern pine snakes. The presence of historic records nearby, the known timber rattlesnake population on the opposite (east) side of Hopewell Road, and records of several road-killed timber rattlesnakes where Hopewell Road meets Stone Mountain, provides the level of information necessary for a Z-scale rank of 4 (Highly Potential Habitat). This property is close enough to an existing timber rattlesnake population to be considered highly potential habitat.

*Cranberry Bogs, Stream, and Wetland Corridor*

This area consists of old cranberry bogs fed by a stream which proceeds into a forested stream corridor wetland. The trees at this portion of the property were pitch pine, black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), white oak, greenbriar (*Smilax spp.*), mountain laurel (*Kalmia latifolia*), dangleberry (*Gaylussacia frondosa*), and lowbush blueberry (*Vaccinium vacillans*). This area is close enough to the potential pine snake nesting habitat to be considered potential foraging habitat. Adult male pine snakes can have a home range of 150-300 acres that it uses throughout the season (R.T. Zappalorti unpublished field research) . If there were pine snakes nesting at one of the potential sites in the open field, there is reason to believe that they could use the surrounding forest, including the wetland and stream corridor, at some point during the season. For this reason, this portion of the property was given a rank of 3 (Potential Habitat) for pine snakes.

The stream corridor on this portion of the property shows characteristics consistent with timber rattlesnake hibernation sites elsewhere in the New Jersey Pine Barrens. The stream is large with tree stumps and root systems along its banks that could potentially serve as rattlesnake hibernacula. Once again, the presence of historic records nearby, the known timber rattlesnake population on the opposite (east) side of Hopewell road, and records of several road-killed timber rattlesnakes where Hopewell Road meets Stone Mountain, provides the level of information necessary for a Z-scale rank of 4 (Highly Potential Habitat). This property is close enough to an existing timber rattlesnake population to be considered highly potential habitat.

During the habitat evaluations at the AeroHaven property, a list of all reptiles and amphibians encountered was kept. Upon the completion of **Phase I**, there have been no sightings of timber rattlesnakes, northern pine snakes, or any other threatened or endangered species on the AeroHaven site. Only common, unlisted animals were found as shown in **Table 1**.

**Table 1. List of all Common Species found During the Presence or Absence Surveys for the Northern Pine Snake, Timber Rattlesnake, and Other Threatened and Endangered Species.**

| Number | Common Name | Scientific Name |
|---|---|---|
| 2 | Green Frog | *Rana clamitans melanota* |
| 3 | Southern Leopard Frog | *Rana utricularia* |
| 1 | Bull Frog | *Rana catesbeiana* |
| 14 | Fowler's Toad | *Bufo woodhousii fowleri* |
| 1 | Box Turtle | *Terrapene carolina* |
| 5 | Painted Turtle | *Chrysemys picta* |
| 1 | Ground Skink | *Scincella lateralis* |
| 35 | Northern Fence Lizard | *Sceloporus undulatus* |
| 4 | Black Racer | *Coluber constrictor* |

*Note*: **None of the Species Found Above are Listed as Threatened or Endangered in the State of New Jersey or are Listed on the Pinelands Commission's List of Rare and Endangered Species.**

## EXECUTIVE SUMMARY AND CONCLUSION

Based upon the habitat evaluation and intensive survey for endangered and threatened species at the AeroHaven site, it is HA's professional opinion that the pine snake and timber rattlesnake could potentially use this site and be present on the subject property. Potential habitat for both these species was found and thought to be typical of other areas where the species have been found. There is suitable habitat for pine snake nesting, as well as mammal burrows and stump holes that could serve as winter hibernacula. There is also potential suitable stream corridor habitat on the northern portion of the property that could provide the necessary conditions for timber rattlesnake hibernation (winter dens).

It is Herpetological Associates, Inc.' professional recommendation that a **Phase II** intensive timber rattlesnake and pine snake study be conducted during the Spring (April) and Summer (through August) of the 2001 field season at the AeroHaven site. This would allow HA to thoroughly survey all the potential habitat areas during the appropriate window of time when they are most likely to be in use by the target species. This **Phase II** study would provide the intensive surveys necessary, at the appropriate time of year, to assess the presence or absence of timber rattlesnakes and pine snakes at the AeroHaven site.

*Respectfully Submitted,*

*HERPETOLOGICAL ASSOCIATES, INC.*

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# Habitat Evaluation for Timber Rattlesnake and Northern Pine Snake at the AeroHaven Site

An Adult pine snake (*Pituophis melanoleucus*)


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